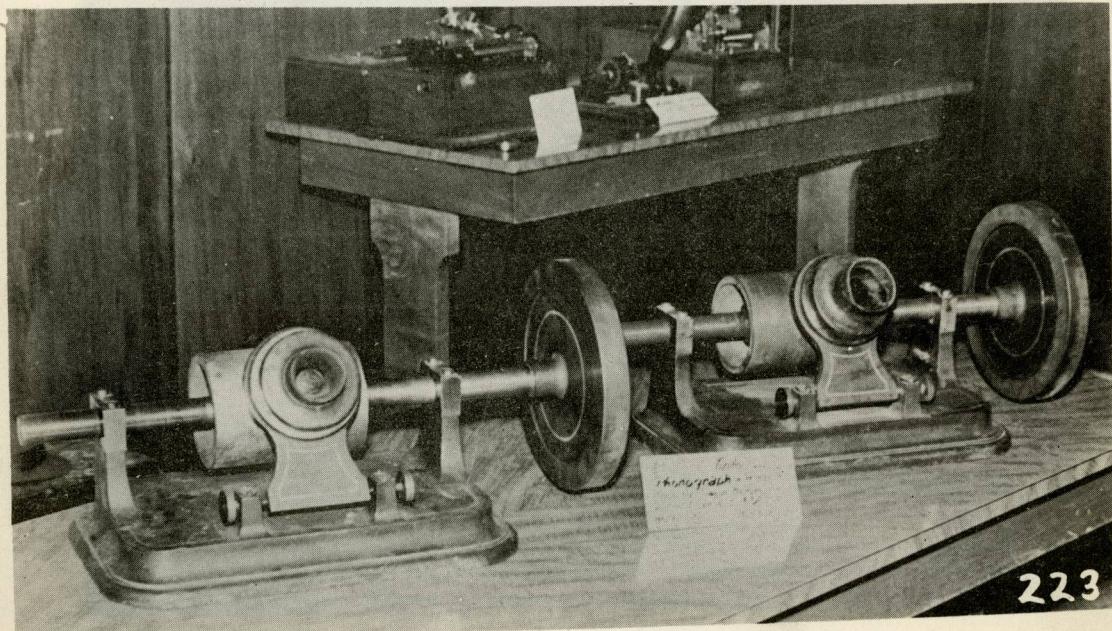




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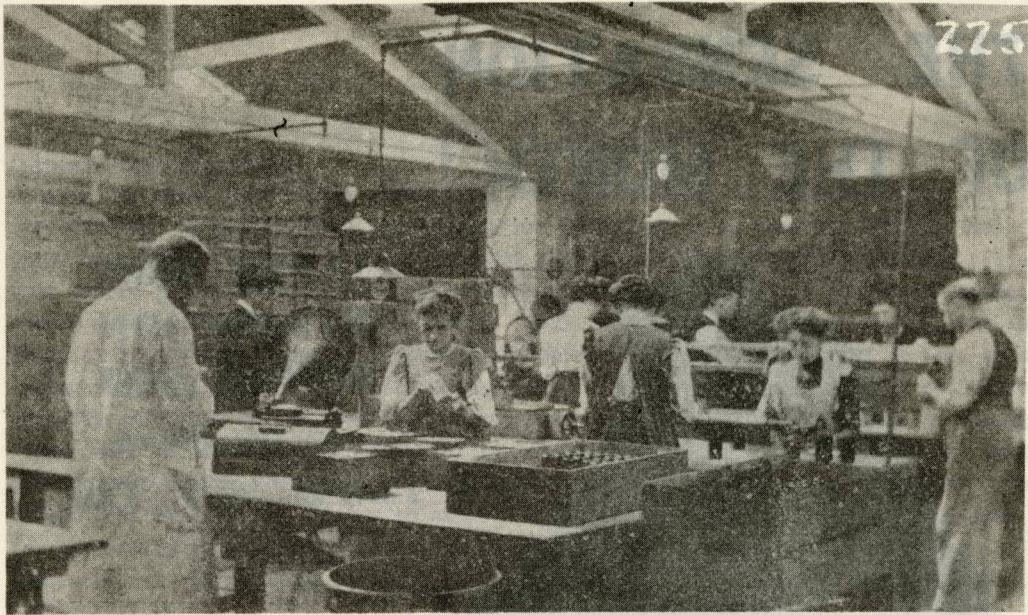
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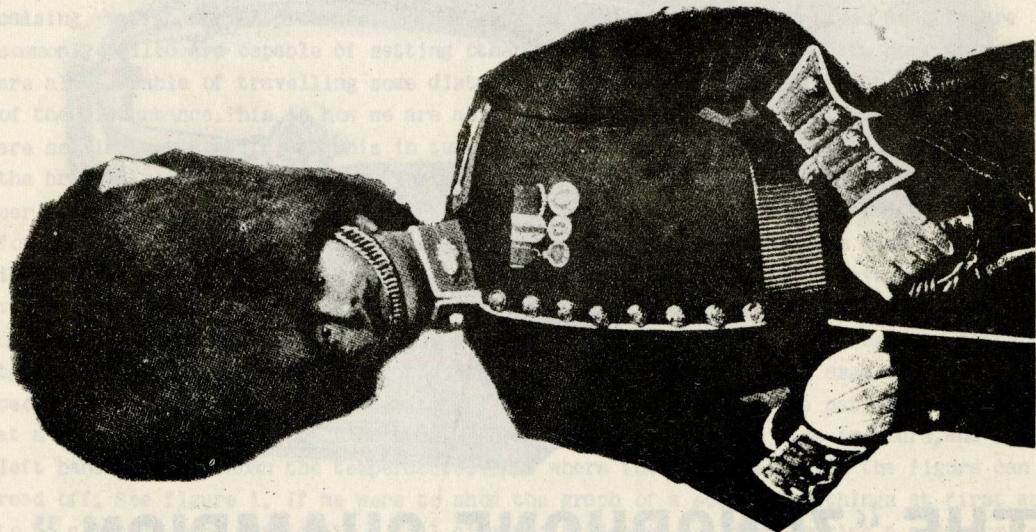
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bound waves consist of waves of constant density, which are set in the air by the action of a charge. These waves are commonly capable of setting up a wave capable of travelling from distance to distance, and the



A. WILLIAMS, MUS.D., OXON, BANDMASTER H.M. GRENADIER GUARDS

# THE SENSATION OF THE MONTH !



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JULY 1907

# Basic Principles of Sound Recording

## by Denis Harbour

### Author's Introduction.

This is the first of a series of articles on the principles of sound recording and reproduction. In writing this, your Editor has begged me to be accurate with my facts, as there are members who could "shoot me down" for any mistakes. While I can hardly believe that people in professional capacity would sit down and criticise - much less complain about - an article written for beginners, I shall try to be as accurate as possible. The velocity of sound, for instance, is given as "approximately" 1,100 ft/sec" in text books, making rough calculation quick and easy. I have given perhaps unnecessarily the correct velocity of 1127 ft/sec. This assumes an ambient temperature of 20 deg.C. or 60 deg.F. Please bear in mind that this material is intended for easy understanding by the layman and for this reason I will avoid the use of mathematical calculations as much as possible. In the next article I shall try to explain a little more about the sound waves, along with few elementary facts about physics - that is mass, inertia and so on, all of which are important for the study of recording techniques.

### P A R T 1.

Sound waves consist of movement of air particles - the air surrounds us at a more or less constant density or pressure, almost like being immersed in water. When physical bodies are set in to vibration by movement of almost any kind the surrounding air moves with it causing variations of pressure. These pressure variations or sound waves as they are commonly called are capable of setting other things in motion if they are near enough. They are also capable of travelling some distance depending on their power, that is the strength of the disturbance. This is how we are able to hear. The small moving parts inside our ears are set in to vibration, and this in turn sends a message through the auditory nerves to the brain - giving a sensation we know as sound. Sound waves travel at a velocity of 1127 ft. per second or 768.4 m.p.h. in air, but in other media it can travel much faster. In iron for instance it is about 15 times as great. Before we concern ourselves with sound recording it may be well to have some appreciation of the way physical bodies behave when set in to vibration. By knowing this we will have a better understanding, not only of the difficulties of the recording engineer, but also to be able to make a fair comparison between different types of equipment. Everyone should be familiar with the common graph used by medical people to show the temperature against time so that the state of the patient can be shown at a glance. Along the bottom of such a graph would be shown the time in hours, and up the left hand side is shown the temperature. Thus where the two lines cross the figure can be read off. See figure 1. If we were to show the graph of a sound wave things at first appear to be a little more difficult. I will give the following analogy. Imagine a pendulum freely suspended on its bearing, but not yet in motion. On a graph or along the centre of the paper we will draw a straight line. This line from left to right represents time the same as in our medical graph, but this is in seconds. We can divide it up in equal number divisions each representing one second. From the left hand, or the start of the line up to the top of the paper we can show motion of our pendulum to say the right hand side. From the same point but

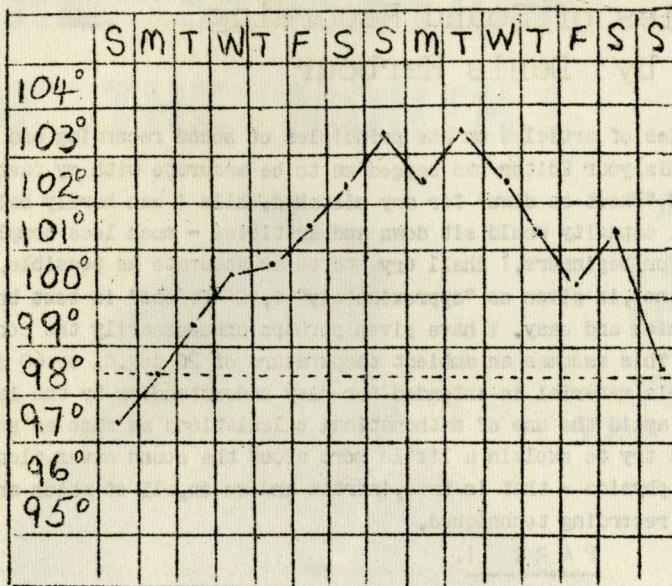


Figure 1  
A temperature Chart which assumes that the patient  
has been very ill,

towards the bottom of the paper will show motion to the left. We can see when we start to swing the pendulum it will follow the pattern drawn on the graph, that is, from zero motion to maximum back through zero to maximum in the opposite direction, and so to zero again. Figure 2. If we were to leave our pendulum swinging without imparting more energy or motion to it, it would gradually come to rest as shown in the graph of Figure 3. The very important thing to note is that the frequency or time cycle of the pendulum has not changed - only the energy has gradually diminished which leaves us only the zero line showing no movement at all. Later on in this series we shall examine different kinds of graph, but to those people who are interested in what makes a gramophone or phonograph play it is essential to know about these rudimentary facts. Going back to our graph, try to imagine a sound wave behaving like a pendulum. Something producing sound is in fact being set into vibration, and will continue to vibrate until the energy has died away. There is no such thing as perpetual motion in ordinary conditions, - if at all - our pendulum comes to rest because the friction (however light or free) of its bearing, and through the friction of the air particles it travels through. So is the case with something producing sound waves - a piano string, a drum diaphragm, etc. Wind instruments do not behave like this because they are being provided with continuous energy to work them - they will only stop when the instrumentalist runs short of breath, or the air reservoir runs out. It is also important to note that the string or diaphragm will lose energy with each vibration, so that in any fraction of a second in time its maximum excursion is never as great as the last one, until

until at last our string is quite stationary. The number of times the string vibrates in one second is called frequency, and the complete movement from zero to maximum in one direction, back through zero to maximum in the reverse direction is called a 'cycle'. To the recording engineer it is always the number of 'cycles per second' - he is never concerned very much with frequencies below this. To the mechanical engineer, dealing with pendulums and the like, movement could be measured in cycles or vibrations per minute, per hour, or per year. Frequencies or vibration can be heard, depending on the age and health of the person, from about 20 times per second to around 17,000 cycles per second. Animals, particularly bats, can hear much greater range of sounds - the silent dog whistle - that is a whistle producing a note beyond the range of human hearing - is another example of this. Later we shall examine why this is so. The number of cycles per second a person can hear depends upon his age. As he grows older his ears become less and less sensitive to the upper register, until sound above about 7,000 to 8,000 cycles can no longer be heard even if produced at much greater volume than the sounds which he can hear. With age, the delicate moving parts inside the ear tend to become stiff and are not so easily set into vibration. I have tried to explain the above facts as simply as possible, so the more advanced reader will have to bear with me for a short time. Before closing the first article I will clarify one more fact - Sound waves do not "travel" in the sense of moving from one place to another - the vibrating body displaces air all round it, each particle pushing against the next and so on, rather like a stone dropped into a pond and causing ripples which gradually die away.

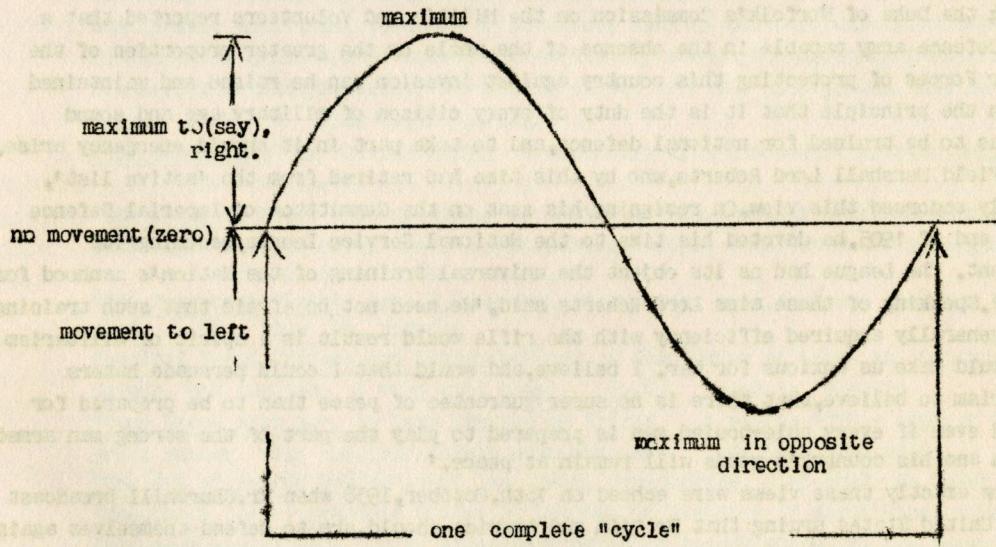


Figure 2.

"Talking Machines" by V.K.Chew. This excellent book is available from the Secretary priced 8s.1d. (\$1 U.S. and Canada) including postage.

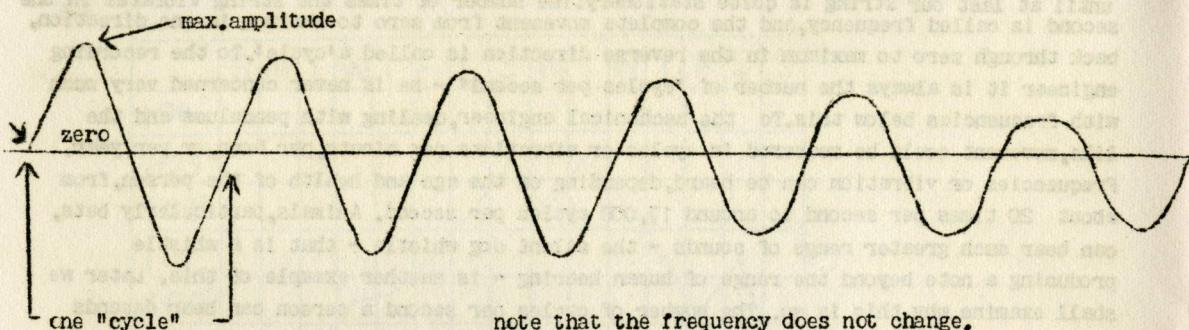


Figure 3. Waveform gradually diminishing in "amplitude"!

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## History on Records No.8. by Leonard Petts Lord Roberts' campaign in favour of compulsory military training in Britain.

In 1904 the Duke of Norfolk's Commission on the Militia and Volunteers reported that a 'home defence army capable in the absence of the whole or the greater proportion of the Regular Forces of protecting this country against invasion can be raised and maintained only on the principle that it is the duty of every citizen of military age and sound physique to be trained for national defence, and to take part in it should emergency arise.'

Field Marshall Lord Roberts, who by this time had retired from the 'active list', heartily endorsed this view. On resigning his seat on the Committee of Imperial Defence at the end of 1905, he devoted his time to the National Service League, becoming its President. The League had as its object the universal training of the Nation's manhood for defence. Speaking of these aims Lord Roberts said, "We need not be afraid that such training and a generally acquired efficiency with the rifle would result in a spirit of militarism that would make us anxious for war. I believe, and would that I could persuade haters of militarism to believe, that there is no surer guarantee of peace than to be prepared for war, and even if every able-bodied man is prepared to play the part of the strong man armed, his own and his country's goods will remain at peace."

How exactly these views were echoed on 16th October, 1938 when Mr. Churchill broadcast to the United States urging that Britain and America should arm to defend themselves against the rising German might. 'Is this a call to war', he cried, 'does anyone pretend that preparation for a resistance to aggression is unleashing war? I declare it to be the sole guarantee of peace.' (These words spoken by Churchill appear on a number of records - see details below).

There are many parallels between the speeches by Lord Roberts (1905 - 1914) and those by Winston Churchill (1933 - 1939) as a comparison will show. Both men devoted their prodigious energies towards awakening an indifferent country to the need for preparedness

against any enemy, alas the cries of both fell upon stoney ground and into deaf ears.

Lord Roberts maintained that the strength of the Territorial Army could not be raised above 300000 men with purely voluntary service. Stressing this he spoke of the necessity for able-bodied man to be trained to defend his country in time of need, urging that everything should be done to bring home to the people 'the fact that if we continue to shirk this, the first duty of citizenship, we can not hope to retain our great heritage.'

Here was no crank championing a passing whim, but a retired Commander-in-Chief of the British Army; a Field Marshal, holder of the Victoria Cross (the highest British military decoration for valour) and one of the greatest soldiers of the age of whom His Majesty King Edward VII had written, 'For over fifty years the Field Marshal has served Queen Victoria, my beloved and lamented mother, and myself, in India, in Africa and at home, with the highest distinction. During that long period he has performed every duty entrusted to him, with unswerving zeal and unfailing success . . . I ask all ranks of my Army to profit by the example of his illustrious career, and of his single-minded devotion to his Sovereign and to his Country.'

In a speech delivered during the July of 1912 he spoke of the unfitness of our forces to meet the great strain that might be put on them at a time of enemy invasion. 'Germany, indeed the whole world, is well aware of the real feebleness underlying the proud boasting as to our military and naval strength . . . If our leaders would have the honesty and the courage to tell the people the truth . . . then I feel confident that the present generation of Britishers would willingly adopt the first necessary reform, the substitution of universal training - compulsory upon all, as the foundation of our Territorial Force.'

More than a year later (via a gramophone record made on 14th August, 1913) we find the Field Marshal still hammering away at his theme 'To create such an army no more is necessary than that young men of this country between the ages of 18 - 21 should consent to an annual training, a training only long enough to ensure efficiency in discipline, drill and musketry, such training to be obligatory on every rank and class alike, high and low, rich and poor, with no exceptions of any kind . . .'

Charges were made that he advocated conscription plain and simple. This of course was not the case. The Field Marshal was urging that for a short and continuous period each year the male youth of the country should receive military training so that in the absence of the regular military forces from the British Homeland a Territorial Defence Force made up of non-regular but trained manpower would readily be available to resist any attack whether in the form of a raid or a serious invasion, should such an event occur. 'What I ask for', he said, 'is that the Territorial Force framework and organisation should remain as it is, but that all able-bodied young men should be passed through its ranks for a continuous period of military training.' On another occasion he added, 'True it is, on the other hand, that the creation of such an army will call for the small sacrifice by every able-bodied youth of the nation of a few months of his time - when he reaches the age of eighteen. But, on this earth of ours what great good has ever been, or can be gained except by sacrifice?'

Compulsory military training is not a measure to meet with general approval or enthusiasm from the public, especially in time of peace, never-the-less against all popular opinion the aged Field Marshal pressed on with his crusade with mounting energy and

enthusiasm. From his gramophone records his message goes forth, 'Everywhere there come to us the sounds of the arming of men, from France, from Germany, from Russia, from Italy, from Austria, our very colonies, the distant outposts of our Empire are one after another beginning to recognise the duty and honour of national training for the defence of one's country.'

The disquiet on Germany's growing might was mirrored by Lord Roberts in his speech in Manchester on 22nd October, 1912 in which he warned 'Germany strikes when Germany's hour has struck. That was the time-honoured policy, of her Foreign Office. . . it has been her policy decade by decade since that date; it was her policy at the present hour . . Under that policy, Germany had within the last ten years sprung as at a bound from one of the weakest Naval Powers to the greatest Naval Power save one upon the globe.'

This great naval build-up caused the British Government to withdraw all but four of her battleships from the Mediterranean and transfer them to the fleet in the North Sea, thus leaving the large Mediterranean area mainly in the control of the Austrian and Italian navies, which, with Germany formed the Triple Alliance.

On 26th June, 1912 Lord Roberts held no punches when commenting on this situation, 'We can not too speedily remedy the dangerous step we are now forced to take. Our military weakness must no longer be concealed from our fellow subjects. If we are to exist as a great nation, there must be no delay in arranging for the replacement of our fleet in the Mediterranean and in completely reorganising our Army . . .'

At the age of nearly eighty, in addition to his arduous campaigning up and down the country, which alone would have floored many younger men of lesser calibre, among other events the Field Marshal carried out State duties in Canada and Russia and took part in the Coronation Ceremony of H.M. King George V.

He did not see his plans for National Service adopted, however, when on that fateful August weekend in 1914 the Great War broke upon the Nation he had the sad satisfaction of seeing his warnings all to dramatically realised. It is reported that a friend remarked that events had justified the campaign for National Service to which the Field Marshal replied only, 'Yes, they would not listen to me,' yet he made no public statement which in the circumstances he could so easily have done.

Fate was to decree that only three further months of life were still allotted to him, during which time he was actively working for the war effort in England. One Wednesday 11th November, 1914 at the age of eighty-two, he set out for France to inspect the contingent of Indian Troops fighting there. After a very full programme carried out in appalling weather he caught a chill which developed into a serious case of pleurisy. He died at eight o'clock in the evening of Saturday 14th November. His remains were brought back to England where they were buried in the vaults of St. Paul's Cathedral on 19th November, 1914.

#### THE RECORDS

Field Marshal the Rt. Hon. Earl Roberts of Kandahar, Pretoria and Waterford, Viscount St. Pierre, P.C., K.P., G.C.B., G.C.S.I., G.C.I.E., V.C., K.G., D.C.L., LL.D., O.M.  
An Address on National Service - Made on behalf of the National Service League.

H.M.V. 01083 (matrix Z 7413F)  
01085 (matrix Z 7415F)  
01087 (matrix Z 7417F)

H.M.V. 01084 (matrix Z 7414F)  
01086 (matrix Z 7416F)  
01088 (matrix Z 7418F)

The above six records which were all single-sided 12" Black Label were recorded on 14th August, 1913.

In August 1920 they were coupled together on three double-sided black label H.M.V. discs on numbers D367 -8-9. In 1924 they were transferred from the General Catalogue into section three of the newly-created No.2 Catalogue of 'His Master's Voice' records of Unique and Historical Interest. They were deleted from this catalogue in June, 1942, since when they have been unavailable. A fragment of the speech appears on 'Jubilee Scrapbook 1910 - 1935', Columbia DX 686.

Sir Winston Leonard Spencer-Churchill, K.G., O.M., CH., P.C., D.C.L., LL.D., A Broadcast to the United States of America, 'Britain must arm, America must arm!', 16th October, 1938.

Complete recordings of this speech are preserved in the B.B.C. Sound Archives and the Archives of the N.B.C. in New York.

An edited extract appears on English Decca WSC 3 and London XL 3 in the 12-record set of Winston Churchill's speeches. Other extracts appear on Philips (Britain) SPL 100; CBS (Britain) BRG 72256; Coronet (Australia) KLC 502; Philips (Europe) A 012999L; Columbia (USA) KL 5066; KOL 7000; Columbia (USA) 78 rpm album A 5066; Decca (USA) DL 9150; Col-pix (USA) S2000; Caedmon (USA) TC 2018; Golden Records (USA) LP 80; V.J. Records (USA) VJLP 1130.

## AN EVENING WITH THE ROYAL BALLET, part 5

by Gerry Annand

Here are a few brief notes on the artistes.

### Margot Fonteyn

Dame Margot Fonteyn is acknowledged throughout the world as the greatest ballerina dancing today, in direct line of succession from balletic immortals like Pavlova and Ulanova. Dame Margot is the first great ballerina to be produced by the English School, and it was her early partnership with Robert Helpmann that gave this School its international reputation.

### Rudolf Nureyev

Born on 17th March, 1938 in Eastern Siberia, Nureyev joined the Kirov Ballet Company in Leningrad when he was 17. He visited Paris with the Company in June 1961 and remained in western Europe. He has since conquered world audiences with the technical excellence, and the spirited fire of his performances in Paris, Rome, New York and London.

### David Blair

He joined the Sadler's Wells Theatre Ballet in 1948, after four years in the Royal Ballet School. He was born in Yorkshire in 1932. One of the Royal Ballet's principal dancers, Blair has played a number of roles from Capt Belaye in "Pineapple Poll", to Colas in "La Fille mal Gardée". He was awarded the C.B.E. in 1964.

### Annette Page

She was born in Manchester in 1932 and joined Sadler's Wells Theatre Ballet in 1950, becoming a soloist of that Company in 1954.

The following year, she transferred to Covent Garden and became a ballerina in 1959. She has danced the leads in all the major classics.

**PETS CORNER.** It is said that a woman's mind is cleaner than a man's, as she changes it much more frequently.

## Profile. 1.

by Sydney Giles

## Lotte Lehmann

It is my aim to tell you every month of artists whom I have had the good fortune to meet and know. Dabbling in photography I have had the pleasure of being invited to meet many singers on their own ground; at times my profile may seem to be rather 'amateur', but my aim is to write about singers as I found them. Some were charming, some acted as if I were not there, but all makes a story of interest.

Lotte Lehmann sang well before my time, and it was good to know that in 1957 she was coming to London to hold some Master Classes at the Wigmore Hall. I wrote to Madame Lehmann asking if she could spare a few minutes of her time at the Wigmore Hall in order that I might take some photographs of her. She replied more or less by return post, informing me that this could be done and she would allow me five minutes of her time. When the day arrived, a Saturday, everything went wrong. First, my flash gun would not work and being employed by a firm which makes me work on a Saturday until mid-day, I lost my intended train to Victoria, and got a slow train, so on arriving at the Wigmore Hall I had five minutes. Having no flash gun, (it was October and the lights went on early), meant if I took photographs outside it would be asking too much of Madame Lehmann at this late hour when she was about to go on to the stage. Anyhow, I thought I had better let her know that I was here, which was easier said than done, for going through the stage door, making my way to her room, I found that she had surrounded herself with some ladies, who would not let me pass into her room until I had shown the letter. Madame Lehmann was a most charming woman, very well dressed. She informed me how impossible it would be to take photographs then, for she was about to go on the stage, so I waited until after the Master Class.

What I had feared was happening. It was getting dark outside. I had told Madame Lehmann of the bad luck I had with the flash gun - and then missing the train, so after a short while in the dressing room we all went outside to have the photographs taken, Lotte her lady friends and myself. Lotte was wearing a very fine stole as she took the pose I

suggested. Now she was to say the nicest thing that any singer has ever said to me, for when I asked if we could have a photograph taken together, she replied, "I would like to very much, for I have never been asked to be photographed by such a handsome young man as yourself." This is what I shall remember Lotte best by, just as she was about to step into her car, she suddenly turned, looked at me and said, "You know, those photographs won't come out, it's too dark." And then smiles.

I must confess that I had the same feelings, I also thought it was too dark, but I thought I would, after the distance I had travelled, take a chance. Before she drove away, I said I would let her know and send her some copies. Well, Lotte was right, they did not come out, I wrote to tell her so. Two months later there was a knock at the door and there standing on the step was the postman, in his arms he had a large package. I wondered what it could be for the stamps it bore were American. Opening it up, there to my delight, from Lotte, was a nice large water-colour painting she had done and a letter saying how sorry she was that the photographs were a failure, but would I please accept one of her water-colours in the hope that it would make up for the photographs. This painting now hangs in a place of honour in my music room, and Lotte as a singer and a person has a place in my heart.

by Peter Curry

### Making a reamer and a shaving device.

It may seem odd to begin an account of home cylinder making with instructions for making two tools to be used in the last stages. Many phonograph enthusiasts may be interested in making a reamer and shaver, whereas relatively few may want to go to the extent of making cylinder blanks starting from scrap wax. Those who have somewhere to melt wax safely, a bench vice (large for preference), some metal working ability and the necessary streak of madness (or whatever their friends choose to call it) should be able to cast their own cylinder recording blanks by methods to be described in the next HILLANDALE NEWS. Anyone who gets a reamer and a shaver made during the next two months will have done about half the necessary work.

Home cast cylinders will, as one would expect, need reaming.

There are also many commercial records that would now be the better for reaming, as they tend to shrink over the years.

Warping is common, especially with cylinders that have at some time been stored horizontally. Before reaming, some attempt should be made to straighten any badly warped cylinders. To straighten a warped wax cylinder, put it on a phonograph mandrel and cautiously warm it while it is going round, using, say, an electric fire or blower. Be careful, as a difference in temperature between opposite sides of a wax cylinder will result in cracking; unless it already be warm enough to have lost its usual brittleness. In cold weather, the heat from one's hand may crack a cylinder, even when holding it the correct way (two fingers inside). As it expands on warming, gently push the record further on to the mandrel; stopping the rotation no more than can be helped. By the time a temperature of about 100° F. (blood heat) is attained, the warp should be corrected. Avoid overheating, as the oily beads which may then appear upon the surface turn into hard knobs on cooling. Then turn off the heat, and keep the cylinder rotating as much as possible while it cools, easing it off the mandrel. It should more or less maintain contact with the man mandrel, but must not be allowed to shrink tight upon it. After this treatment, reaming may not be necessary, but please note -- it would be risky to try to stretch a cylinder by this method.

Blue Amberols, and other types of plaster cored record, are not so easy to straighten. Some improvement may be effected by pressing the record firmly on a plaster mandrel (v.1.), after it has been left over night stuffed with damp rag and wrapped in polythene sheeting. Move it from time to time as it dries, lubricating with a minimum of dry soap to prevent sticking. Reaming may then be tried before resorting to the drastic methods suggested by the late Mr. F. G. Arkell in the December, 1964 HILLANDALE NEWS, (pages 96 - 97).

To make your reamer, procure about a foot of 2" x 2", almost any sort of reasonably dry, knot free and straight-grained wood. Plane it, getting one side particularly straight and free from twists. Mark this side. Use a squint plate (piece of metal with a  $\frac{1}{16}$ " hole through it) to ensure accurate shooting. Cut the length to one foot exactly, squaring off by the marked side. After marking the centres, scribe a circle on each end, one of radius  $\frac{15}{16}$  inch, the other of radius  $\frac{1}{4}$  inch. Draw a perpendicular from the centre of each circle to

the marked face.

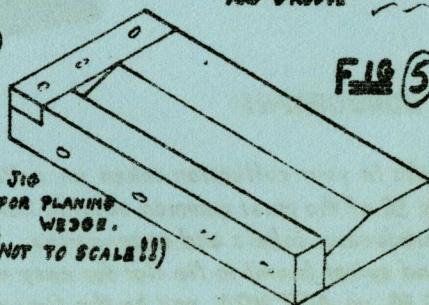
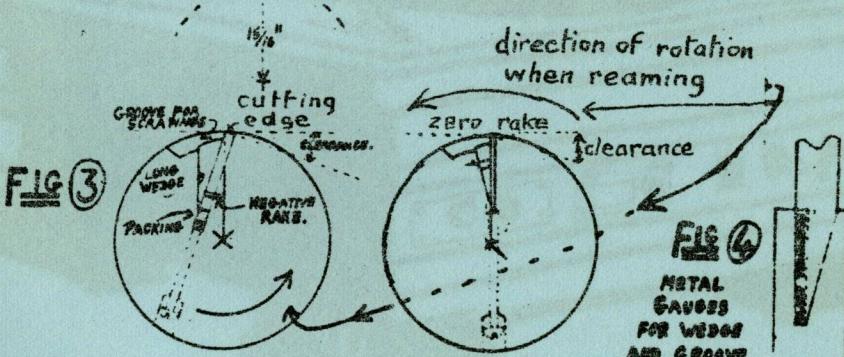
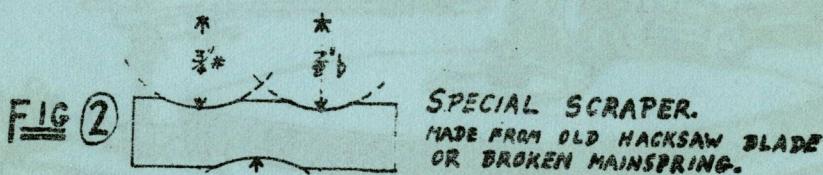
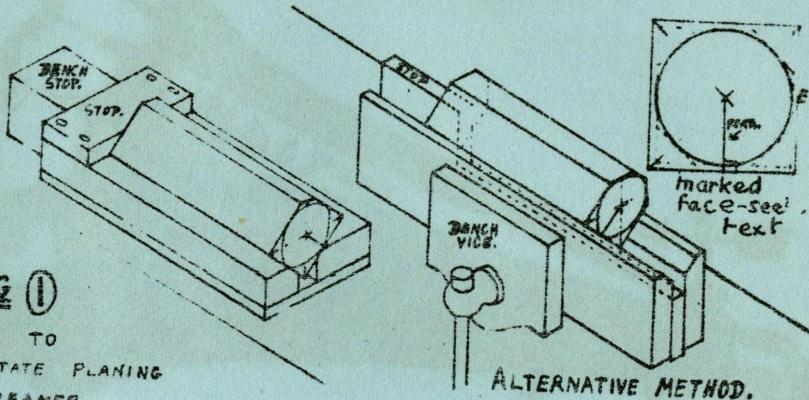
Now make a jig to support the piece of wood cornerwise (see Fig. 1) while you plane it to an octagonal shape. It need not be a perfect octagon as long as the sides are straight and free from twist, and tangential to the circles at both ends when finished. Check to make sure that the difference in diameters of the two ends is going to be exactly  $\frac{1}{8}$  inch; and adjust, if necessary, by thickening one of the circles inwards and planing down appropriately. The suggested radii were somewhat on the big side to allow for subsequent adjustments. A pair of slide calipers will be useful in this, and other cylinder making stages. A suitable type, with a Vernier scale measuring in 128ths. (half- 64ths.) is obtainable at tool shops for about ten shillings.

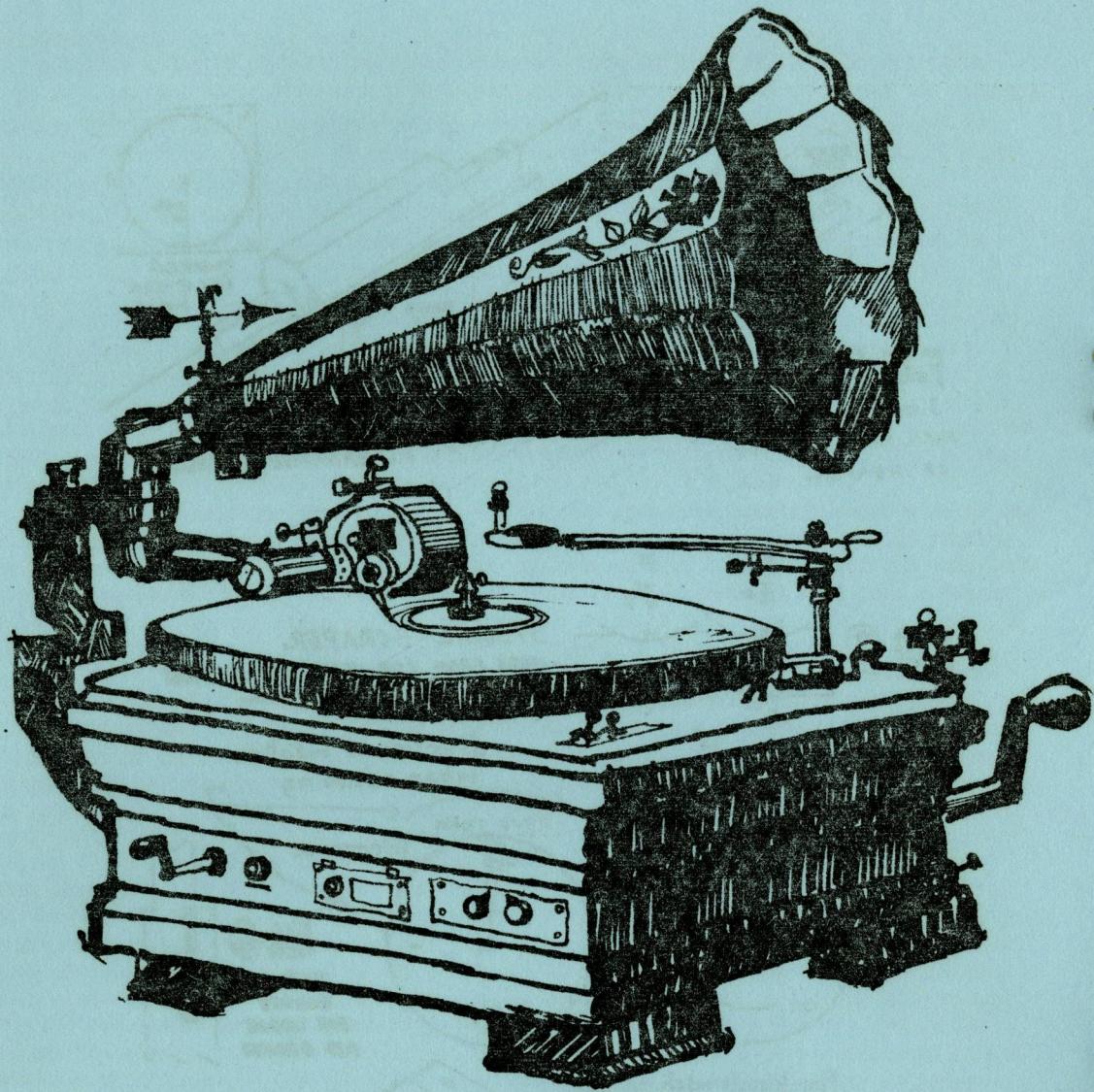
Now plane the edges of the octagonal shape to make it hekkadecagonal (or whatever it's called), and so on, and so on. As the section becomes more circular, it will become more difficult to judge straightness by the normal method, and a good straight-edge will prove helpful. The facets will be straight sided, tapering evenly towards the narrow end of the cone frustum being produced, if the planing be straight and true. When the section has been made as circular as practicable by planing, the ridges may be removed using a special steel scraper (Fig. 2.) with suitable hollows in the edge ground with a gouge slip.

Now select a cylinder that is a good fit on your phonograph mandrel, and try it on the reamer. When glass-papering down, it may be necessary to correct a slight error by rubbing one end down more than the other. The "test" cylinder must be a good fit at both ends, both on your phonograph mandrel and your reamer. A reamer with an error of more than a "thou" or two in the taper will cause one of the troubles which it is supposed to cure, viz., a tendency for the record to creep off the mandrel while it is being played.

Now draw a line along the mandrel joining the ends of the two perpendiculars drawn from the centres of the ends to the marked face in the initial stages. This indicates the position to be occupied by the cutting edge of the blade, which must be in the same plane as the axis of the reamer. A strip of glass, best cut with a diamond-glass-cutter, makes a good blade for reaming wax. The broken edge, not the scratched edge, makes the cutting edge. The rake (Fig. 3) must be negative to ensure positive clearance. An old hacksaw blade ground smooth makes a better blade for plaster cored records because it can be re-sharpened. Start cutting the groove for the blade by making a saw cut just behind the line drawn. For a glass blade, saw in a direction to miss the centre of the small circle by  $\frac{1}{8}$  inch or more, the large by about  $\frac{3}{16}$  inch or more. For a steel blade, start by cutting inwards towards the centre. The cut may then be widened using glasspaper wrapped round a metal strip, a plane blade or steel scraper. The blade may be wedged in by various methods: say, paper, rubber, paper covered rubber, or by a long wooden wedge as shown in Fig. 3. Specially made metal guages (Fig. 4.) will be a help when finishing the slot, and in making the jig (Fig. 5) for planing the wedge. The wedge-taper should be about 1 or less in 8. Fine adjustment of the blade may be effected by the use of three screws as in Fig. 6. The holes may be bored before the groove is cut, or using the groove as a guide. The holes are drilled the appropriate tapping size ( $\frac{3}{32}$  inch for  $\frac{1}{8}$  inch Whitworth), and widened at the outer ends to accomodate the screw heads. Metal screws are driven in like wood screws, no tapping being necessary. Note the bits of packing (matchsticks will do) to prevent the hard screw ends from splintering the glass. Fig. 7 shows an alternative arrangement for blade adjustment using thin wooden wedges.

When the reamer is finished, it is as well to practice on some home made, worn out or mildewed records. If the blade be set too coarse, or the reamer tend to stick, it will be found difficult to avoid breaking the cylinder. Rubbing with French chalk may be advisable. Note that the setting of the blade can have an effect on the degree of taper the reamer cuts. A tendency for the reamer to produce bores that are wide at the ends by comparison





### KNOW YOUR PHONOGRAFS!

Have the phonographs in your collection taken on a Rube Goldberg appearance? A 'Portfolio of Early Phonographs' shows 50 of the most common outside horn phonographs with enlarged detail of important features such as reproducers, labels and accessories. Each machine is pictured separately on heavy 8X10 glossy stock and spiral bound to lie flat for easy viewing. This Portfolio will be sent to you Post Paid for just \$5.50, so ACT NOW, and be the first collector in your block to own one! write: Lawrence A. Schlick [redacted] Worthington, Minnesota U.S.A. 56187

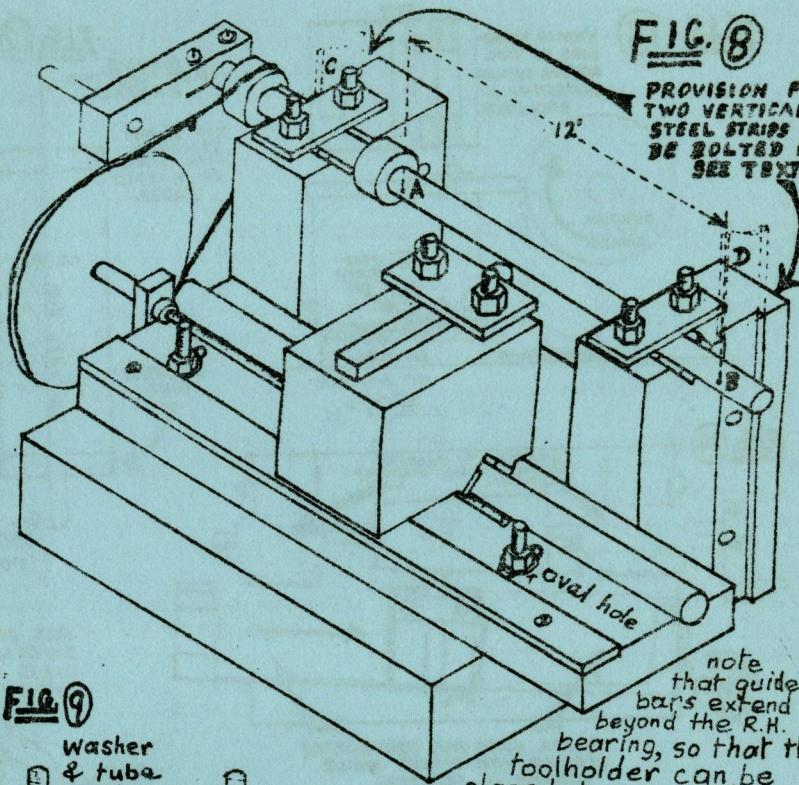
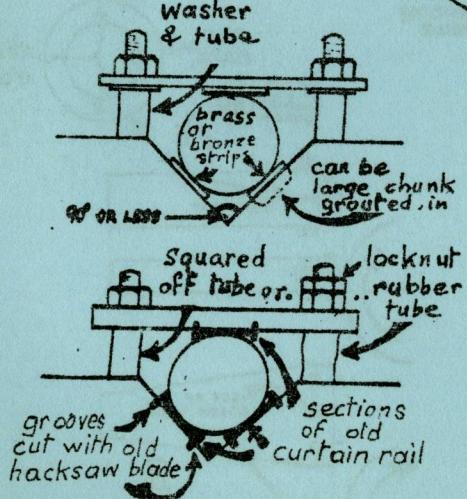


FIG. 9



FILED 10

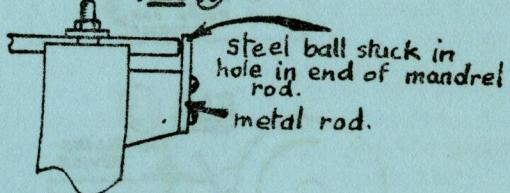


FIG. 11

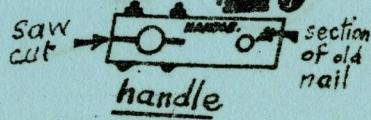


FIG. 13

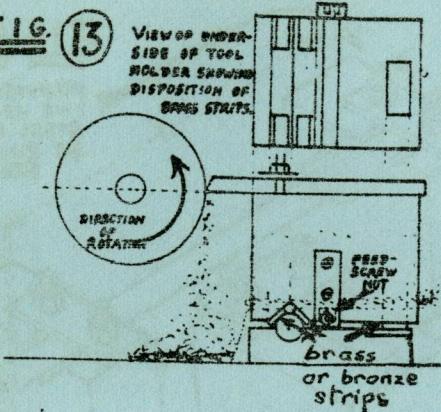


FIG. 12

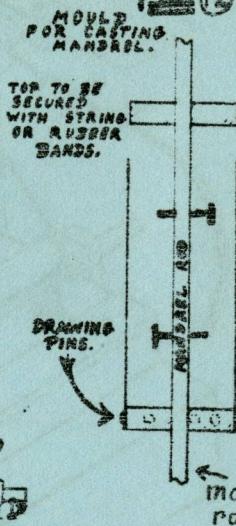
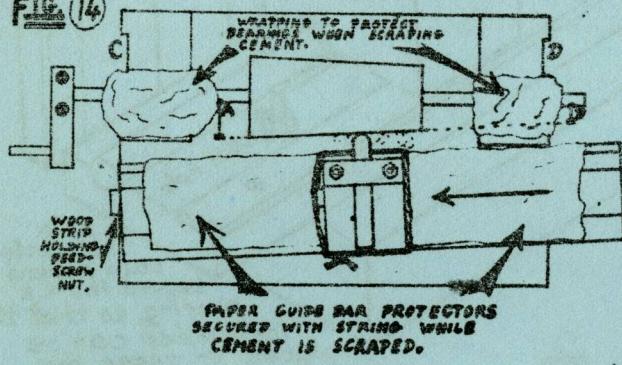


FIG. 14



END OF BROKEN OFF GLASS ROD OR TUBE.

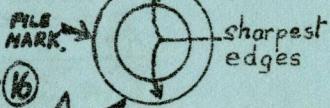


FIG. 16

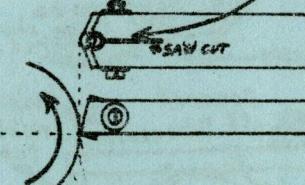
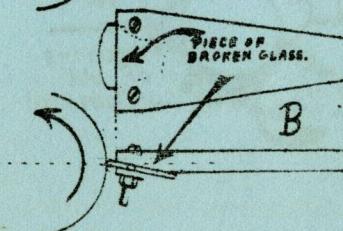
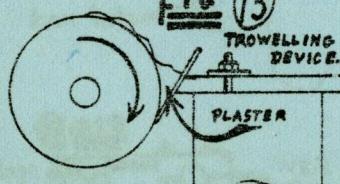


FIG. 15



B

with the middle would probably be caused by the cutting edge of the blade being slightly skew, i.e., not in the same plane as the axis. It may be corrected by suitably widening the groove; but as it is difficult to know which way to correct it in such cases, a simpler solution might be to make the blades with a slight curvature to compensate. Once you have reamed a cylinder to make it fit on your mandrel, mark the position that it occupied on the reamer in the last stages of cutting, for future reference.

Unless they have been made with unusual skill, home made blanks will need a good deal of shaving before they run true. This would be a lengthy job with an ordinary shaving device, and would, in fact, be best done on a lathe. Those who haven't access to one will be able to do the job on the shaving device to be described, since it is really a specialised form of lathe.

The shaver consists essentially of a mandrel that can be turned by hand (or a motor, if available) alongside which a cutting tool in a holder can be slid on rigidly fixed rails. Fig. 8 gives the general idea of the outfit. It may be made with blocks of wood, or, as weight and rigidity are desirable, the larger parts may be cast in cement. Any holes required may be moulded in using well waxed (soft paraffin wax) metal rods; or bored, before the cement has quite set, using boring bits made of steel strips. When cement is used as a substitute for cast iron, a strong mix (about 1 part cement to 2 parts sand) should be used, and the ingredients should be sieved through 16 - 20 mesh gauze. Reinforcing, say, with old fencing wire, is advisable.

The steel rod, round which the mandrel is to be cast, should be a straight piece of half inch (or thereabouts) round bright. Drilled metal plates would serve as the "head" and "tail" bearings, but be sure of a good finish on the shaved blanks, proper pedestal bearings (obtainable at tool shops) or the three-point type shown in Fig. 9 should be used. In the latter type of bearing the rod is supported by three chunks of brass or bronze (bits of old curtain rail, etc.), the top one being more or less adjustable. They may be held by screws and 'Rawlplugs', grouted in or stuck on with tile cement. The mandrel may be prevented from slipping along when rotated by an extended metal strip in one of the bearings, fitting between two collars (also obtainable from tool shops) as shown in Fig. 8, at the "headstock" end. Alternatively, one collar and the method of Fig. 10 may be used.

Those who intend to try to make blanks starting with broken wax cylinders should make provision for two steel strips, 1 inch x  $\frac{1}{4}$  inch or heavier, to be bolted to the bearing blocks just behind the bearings, as shown in Fig. 8, and 14 at C and D. The distance between the strips must be four or five inches longer than twice the length of the longest cylinder to be made.

The tool holder consists of a heavy block of cement (a brick-end would do, but a masonry drill would be needed to make holes) sliding along a rod and a flat strip as shown (Fig. 8, 13). The tools are clamped under a steel strip held by coach screws through the cement, let into the cement when casting, or grouted into holes bored through the cement. It must be possible to slide the holder in a direction out of parallel with the mandrel in order to cut a taper. The guide bars are therefore let into a separate block of wood or cement held to the base by bolts in oval holes (Fig. 8). Fig. 13 shows how the tool holder slides, running on five brass or bronze strips, on the guide bars. The four strips in the front form a pair of vees, set as far apart as practicable, running on the round rod (about  $\frac{1}{2}$  inch bright), which does most of the guiding and must be straight. A thickish strip of glass would do for the back guide bar. The fifth brass strip runs on it so that rotation of the toolholder about the front bar is prevented.

The guide bars and the mandrel rod should extend beyond the "tailstock" as shown in Figs. 8 and 14, so that the toolholder may be placed on the other side of the "tailstock" as shown (or right hand bearing block) to gauge the distance of the tool tip from point B on the free end of the mandrel rod. It would be possible to use the shaving device as a lathe for

turning laps for making recording cutters if the guide bars were extended about  $1\frac{1}{2}$  inches farther still, and the base of the shaver also extended.

The mandrel is cast in cement round the mandrel rod. The mould, shown in Fig. 12, may be

quite a rough affair consisting of two drilled wooden discs, a tight fit on the rod, spanned to form a hollow cylinder as indicated. Waxed manilla or Polyglaze may be used. Note the two old nails, in holes drilled through the mandrel rod, to make sure the casting will be as one piece with it. The top disc is slid down after the cement is poured into the mould. The casting should be somewhat fatter than the finished mandrel, and about two inches longer than the longest cylinder you intend to put on it.

In about a day the cement should have set, but should still be soft enough to permit of scraping to a more or less accurate shape using lathe type tools which may be made of mild steel. Use slide calipers or specially made metal gauges to set the taper to  $\frac{3}{16}$  inch per foot on the radius at points A and B, figs 8, 14. When scraping the taper, turn the handle (Fig.s 8, 11) with the left hand while feeding the tool in the holder with the right hand, at the same time applying downward pressure. Note from Fig. 13 that the mandrel is turned the opposite way to a lathe mandrel, the tool being in the holder upside down. It will be found easier to do it this way. During the cement scraping operation the bearings and guide bars must be protected, say, by oily felt and paper, as indicated in Fig. 14. Do not try to take off too much cement with each feed. After each cut, advance the tool a little towards the mandrel rod, until the taper formed is about 1 and  $\frac{3}{16}$ ths. diameter at the larger end. Note that the cutting edge of the tool must be level with the axis of the mandrel (Fig. 13).

Plaster, just after it has set, may be scraped into shape in the same way as the cement. Porous plaster mandrels for straightening warped Blue Amberols (v.s.) may be made in this way.

The cement mandrel, after scraping, is depressingly rough and crumbly. After a day or two brush it all over with a hot half-and-half solution of water and water-glass, and allow it to dry in an upright position, inverting it from time to time. There are several ways of putting a smooth, accurate finish on the cement. Plaster may be put on, using the trowelling device of Fig. 15, which consists of a square of metal screwed to the end of a stick held in the tool holder. The plaster may be scraped after it has set, and when it is dry it may be scraped again and smoothed with fine glasspaper, adjusting the taper if necessary. It may then be given any finish you fancy, using shellac, paint, etc. Alternatively the cement, when dry, may be covered with a paste made with broken records, shellac type (disc) and methylated spirits (they take a day or two to dissolve). This may form an under-coat for a fibreglass "gel" coat, or may itself be built up (it takes a long time to dry when thick) and brought to an accurate finish.

It may occur to you that a reamer could be made in this way. No doubt it could -once the problems arising from the fact that a groove has to be cut have been solved.

The guide bars may now be set parallel to the mandrel rod ready for trueing and shaving cylinders. Tempered or high speed lathe tools may be used for trimming off the worst irregularities. Broken glass has a good cutting edge for wax, furnishing some approximation to a sapphire edge. Fig. 15a shows a wooden tool with a tip consisting of a cut off (broken at file mark) piece of glass rod or tube. As the sharpness wears off the cutting edge, the tip may be turned to bring a fresh edge to bear on the wax. It may be inverted when one end is blunt all round. Fig. 15b shows a similar tool using bits of broken sheet glass.

When cutting wax, it is better if the tool holder can be fed along by a screw geared to the mandrel. The ratio should be somewhat steeper than indicated in Fig. 8. Screwed rod ( $\frac{3}{16}$  inch B.S.F. or 2 B.A.) may be obtained from ironmongers and "ham" radio shops. The nut  $\frac{16}{16}$  may be fixed in a piece of wood screwed to the tool holder (Fig. 13) by pressing it into a hole slightly too small for it. I know that it is possible to make a reamer by the methods described, and that it is successful, because I have done it myself. I cannot say the same about the shaving device, but I could not get one made before this article was due to be submitted to Ernie Bayly. I shall have one completed by the time you receive

## How I started collecting

Peter Betz

When I was a boy of almost twelve, our city, Amsterdam, New York, had a sesqui-centennial, 150 th. year anniversary celebration. Now to you European members this will sound laughable, but any American city which has had its charter for 150 years or more is thought to be antique.

As part of the celebration, men grew beards, people dressed in old fashioned clothing, and many stores placed old objects in their windows. Thus I saw my first cylinder phonographs I can remember only that two were Graphophones and one was the rather obscure Echophone. One of the Graphophones was in the music shop, and here I heard my first cylinder record played, an Arthur Collins vocal, the title of which I have forgotten.

I was immediately captured by it, and have been capturing them ever since. Previous to this event, however, I had cut my teeth on various old acoustic discs, donated by one relative or another, and was encouraged by an aunt who once worked for Columbia, and who has a fine set of discs, which she plays to this day on her Grafonola. An old, upright Victrola had entranced me since before I could reach the crank, and when in 1947, my father secured one of the first postwar inexpensive players, as he tells it, "my eyes gleamed with joy all the way home".

But that is all background. In the fall of 1954, after the local celebrations had abated, I hunted high and low for a working cylinder phonograph. I did not know where to look for one nor what to pay for it. My aunt provided me with a dozen odd cylinders from the farm house attic, but the phonograph had apparently disappeared long ago. I resolved to make a player, and surprisingly enough, I managed to construct something that would work, out of an old set of child's tinker-toys and an old electric motor. The reproducer consisted of a steel needle, attached to a metal aspirin box, suspended above the record track with toy wheels, as train wheels fit on a track. It worked particularly well with Blue Amberols, but was no contribution to acoustical science. After a while, the motor started to spit sparks at me, and that was the end of that.

In November, a few days short of my twelfth birthday, Dad took me to the neighbouring town of Fonda, best known for having several antique and junk shops, plus the county jail. We had good luck right away. From one I obtained a Standard, less crank and reproducer for \$2.50, and from another, a good Home combination player with model C reproducer. At \$6 it was the most expensive purchase I had ever made, but you can bet there was music, of sorts, in that home that night.

A few weeks later, we discovered Mr. Jason Coppernoll's shop at Palatine Bridge. My eyes popped to see so many machines and literally thousands of cylinders, and I was awed to see literally thousands of cylinders, and I came away with a model H reproducer and an agonizing feeling of unquenchable envy.

The collection began to grow, for in those days, complete outfits with a hundred records or more seldom cost as much as \$10, and I can remember buying hundreds of Mr. Coppernoll's seconds and thirds at five and ten cents each, plus a few of his fine mint condition cylinders at the then astronomical price of fifty cents.

Well, we grew, the collection and I. We are both still happily at it, despite my wife's distress, for she understandably prefers that I do the dusting in the hobby room.

this HILLANDALE NEWS. If, in trying to carry out my instructions you encounter insuperable difficulties, or if you finish your shaving device and find that it does not work, just write to let me know. I may, by then, be in a position to offer my sincerest sympathies.

## NEW ZEALAND SPRINGS A SURPRISE by Walter Norris

On the front cover of this issue of the HILLANDALE NEWS you see a picture of TWO tinfoil phonographs! . . . . . But, read on . . . .

Who would have thought that in a small country like New Zealand, not only one, but two Tin-foil phonographs would be discovered. For many years the existence of one has been known, being owned by Mr. C. E. Woledge, a retired phonograph dealer of Christchurch (which I have since purchased). Recently Mr. Wally Golledge of Nelson has been fortunate in obtaining a Tin-foil machine. On comparison the two prove to be the same in every detail. This second discovery has made New Zealand collectors speculate as to whether any more such machines will be found in this country. Both of these machines were on display at the 1967 Phonograph and Record Collectors Convention held in Christchurch (New Zealand) at Queen's Birthday Weekend in June last year. This Convention was held under the auspices of the Vintage Phonograph Society of New Zealand (Inc.) and the Tin-foils were the highlight of the machine display. It is thought that they were manufactured by the Edison Company or Sigmund Bergmann, one of Thomas Edison's early associates.

The late Mr. C. E. Lindsay of the Dominion Museum in Wellington wrote to Orange, New Jersey to obtain information about the Tin-foil then owned by Mr. Woledge. I quote from the most informative reply received from Mr. Norman R. Speiden the Supervisory Museum Curator:-

"The earliest indication we have that Mr. Edison was aware of the possibility of recording and reproducing the human voice is a note written by him on the bottom of a sketch dated 18th. July, 1877, to the effect that he had been able to store up the human voice by indenting on waxed paper so that it could be reproduced anytime. These early experiments were probably carried on with a machine known as the Embossing Telegraph or the Telegraph Repeater that recorded the telegraph messages on disc turntables.

Recently acquired documents have revealed that Edison's assistant John Kreusi, started to make the first phonograph on 4th. December, 1877 and finished it on 6th. December. It was taken to New York City and demonstrated at the offices of the Scientific American on 7th. December. The patent application was filed on 24th. December 1877, and Patent No. 200,521 was granted on 19th. February, 1878.

The Edison Speaking Phonograph Company was incorporated in Norwalk, Connecticut, on 24th. April, 1878, by a group of men most of whom were also connected with the telephone interests. This company was licensed by Edison to manufacture and sell the phonograph in the United States. Most of the Tin-foil Phonographs that were put on the market were manufactured under this license, in various machine shops, several hundred at a time. Although they all utilised the same principle, these machines varied in size and in some mechanical details. There were at least three various types of small machines made to sell for around \$ 10, and three or four types of larger machines." The latter were similar to those found in New Zealand.

Midlands meeting

The next meeting will be on 25th. May at the Giffard Arms Victoria Street, Wolverhampton, commencing 7.30 p.m.

The Midland group of the Society held its meeting at the Giffards Arms, Victoria Street, Wolverhampton, on Saturday 16th March when there was quite a good turnout of Members and Friends from many parts of the Midlands and even farther afield. Once again there was a good display of machines including a magnificent example of a two-speed Columbia Graphophone in showroom condition.

The recital for the evening was given by Eddie Dunn of Shirley, his subject being a cross-section of male operatic singers on Pathé discs. Reproduction was, on the whole, magnificent; thanks to the loan of Leon Cowlishaw's excellent large external horn machine and the use of a portable amplification system, although the various speeds encountered on Pathé were sometimes a problem. Among the several fine tenors and baritones we heard was a record of Paul Althouse, the American tenor who made his debut at the Metropolitan in 1913 at the age of 24. On this disc he performed the aria "Cujus Animam" from Rosini's 'Stabat Mater'. Another excellent record was "Dai Campi, Dai Prati" from Boito's 'Mefistofele' sung by the Italian tenor Aristodemo Giorgini who is well served by his other recordings having appeared on both Edison Discs and Cylinders and also on G. & T. Of the older singers we heard Mario Ancona singing "Vien Leonora" from 'Favorita' dubbed from a 1906 cylinder. Ancona, who was born in 1860, had the distinction of performing in the world premiere of Pagliacci. The final record of this recital was of course a Caruso. Here we had the master performing "E Lucevan . . ." from 'Tosca' and in spite of the great age of the recording (it was dubbed from one of the A.I.C.C. cylinders) the superb mastery of Caruso was very much in evidence.

The next meeting of the group will be on Saturday 25th May at the same venue, when Mr. Bob Duke of Loughborough will speak on the pioneer jazz trombonist Harry Raderman, using Edison cylinders.

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### A Letter from Walter L. Welch

15th April, 1968

Dear Mr. Bayly,

Re. the article in your December 1967 issue entitled "An Evening with Giovanni Martinelli".

On p.177 your London Correspondent questions whether the distortion in the singing scenes with Grace Moore from the talking picture "One Night of Love" were due to a "local fault or could be blamed on the pre-recording techniques". He commented that (this distortion) "does not seem to support the opinions expressed in 'From Tinfoil to Stereo', page 357."

May I respectfully submit that in my opinion, the distortion was due either to an impedance mismatch or a technical malfunction in the soundtrack scanning and amplification system. The opinion on page 357 of 'From Tinfoil to Stereo' was that of P. Wilson, famed authority of 'The Gramophone' to whom credit is given on the previous page and is within quotation marks. I had attended a showing of "One Night of Love" when synchronised with Vitaphone records prior to dubbing sound-on-film. There are two basically different systems employed for this dubbing, as well as a considerable evolution in the reproducing equipment in the years since this was done - much more than in the picture projection

My co-author, Oliver Read, may have more information on this, but as I was responsible for the quotation of the comments of P. Wilson, I feel it appropriate to reply.

Sincerely,

Walter L. Welch

Curator and Director, Audio Archives, Syracuse University Libraries.

## CORRECTIONS and ADDITIONS to the EDISON NUMERICAL CATALOGUES supplied by GERRY ANNAND.

2700 to 2712 are banjo duets by Farmer and Curry

7233 to 7235 and 7245/6 the mandolin soli are performed by W.C. Townsend

7334/5 delete Joe Belmont. Insert Nina Angela

7241 is now identified as Serenade from 'Iris' (Mascagni) played by the Peerless Orchestra.

## A Visit to the Clarion Record Company Ltd.

(Extracted from The Talking Machine News of September, 1910)

We are afraid to say how long it is since we paid a visit into the wilds of Wandsworth (part of London=Editor). It was just about as unpleasant an afternoon that one could imagine and the mud that had been churned up by the wheels of waggons passing up the unpaved lane which led to the works by the side of the railway was not calculated to inspire one with the beauties of music or the home thereof. However, we were upon business bent. We had arranged to go through the company's extensive plant to take notes for a special article. It was an interesting visit, for at the time cylinders and discs were being made in great numbers and everything pointed to a long life of prosperity and activity at the Wandsworth factory.

It is an old saying that one should never judge by appearances, and so it proved in this instance. Before our notes upon the Premier Company were in type and on the eve of the photographer's visit, down came the bomb. We learned that the company was 'in difficulties' and that 'The Receiver' was administering affairs.

And so matter remained for month after month, and we, together with most members of the trade came to the conclusion that the portals of the Wandsworth factory would be permanently closed and that the Premier Company was as dead as the proverbial doornail. And so to all intents and purposes was the case. The manufactured goods on the premises were carted away and found a place on the market at ridiculous prices.

In the whirl of business the affairs of the Premier Company passed from our mind. Imagine our surprise, then, when we were rung up one day last week by the cheery voice of Mr. G. C. Hallett, inviting us once more to make a pilgrimage to Wandsworth. He was sure that he would please and astonish us. So we set forth, taking the electric train to Putney Bridge Station. Ten minutes walk brought us to our destination. It was pleasant indeed for the roadway was now dry and dusty and there was a cheerfulness about the whole place.

Our old friend Mr. Hallett was there to greet us, and seated in his snug little

office we heard the of the gallant battle that he had waged against adversity; how he had persevered and was rewarded with success. It would not interest the trade to hear of Mr. Hallett's struggles to save the situation, but by dint of his efforts the new company has arisen, Phoenix-like upon the old 'Premier' and shall henceforth be known to the trade as the Clarion Record Company Ltd.

Quietly as Mr. Hallett has gone about his business, the long experience gained while working with Mr. James Hough held him in good stead. His friends among those in the trade are numerous, so when financial support was asked for it was forthcoming, and not alone - for it came with patronage from one of the largest factors in discs and cylinders to be found in the country.

It was therefore determined that Mr. Hallett, who had carefully gone into figures and set out a new programme to be followed, should have a chance to deal with the Wandsworth premises and plant. The whole of the premises was overhauled, a new recording room was fitted up, and the services of Mr. C. R. Johnstone engaged. A few of the heads of the mechanical departments were retained. Under those conditions Mr. Hallett took charge of the whole concern. Mr. Johnstone and he work hand in glove together and it is certain that the technical knowledge of the one and the marvellous energy and commercial knowledge of the other will bid for the most complete success.

Mr. Hallett does not believe in blowing his "clarion" too loud, but before the season advances he is confident that the records which are being made in their new recording room by some well-known artists and their excellent instrumentalists will find favour with the dealers for the price and admirable selection, and with the public for their excellent production.

The price for the cylinders is to remain unaltered at nine pence retail, and they are to be known in the future by the "Clarion" Red Label Gold Moulded Records.

(Editor's note. The Clarion company continued to produce cylinders until the early part of World War I, gaining the distinction of being 'second latest' producers of cylinders, being survived only by the Edison Company. - That is, discounting those made for office dictating machines.)

Illustrations for this article are found on pp. 224/5. Firstly we see a disc 'wax' being inspected in the recording room, and below a view of a part of the moulding room, in which we see one man who appears to be taking a cylinder from a mould. On page 225 we are in the inspecting room.

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Thumb Nail Sketches, No. 74 by Tyn Phoil  
 Hungarian Dance in G Minor (Brahms) Edison Blue Amberol 23309  
 played by the J. H. Squire Celeste Octet (Moss Squire Orchestra)

Johannes Brahms was born in Hamburg in 1833 and received his early musical education from his father who was a theatre orchestra player.

Brahms made his first appearance as a pianist at fourteen and at twenty-one made a concert tour when he met Joachim, who pronounced him "a genius". His early compositions meeting with little enthusiasm, Brahms spent some years in further study.

In 1862 he was in Vienna conducting the works of Bach and Handel with great lustre. His first symphony, on which he worked for ten years, had immediate success and was produced

in 1876. His greatest work "Requiem", a sacred cantata, was first performed at Bremen in 1868, London 1873 and New York 1884.

Brahms wrote many symphonies, much chamber music and many songs. These Hungarian dances are among the most graceful things he wrote. He died in Vienna in 1897.

The J.H.Squire Celeste Octette was a popular attraction in the first 30 years of this century. In addition to their work for Edison, they recorded many sides for Columbia.

## OUR ILLUSTRATIONS

Our front page shows two Edison tin-foil phonographs on display in New Zealand, for which the description is elsewhere. On pages 224-5 we see glimpses inside the factory where Clarion cylinders & discs were made, this also being described elsewhere. The Zonophone and Cinch gramophones were made by the Gramophone Company, being "subsidiaries." The Zonophone advertisement dates from 1907, while the Cinch is from 1910. On the back page we see an advertisement from a shop in Sydney, Australia, showing two Edison disc phonographs. We are grateful to John Simpson and Colin Grade for their co-operation in loaning the original.

Dr. Williams, on page 225, was an illustrious Bandmaster of the Grenadier Guards, whose recordings are possessed by many Members. The photograph dates from 1907 & we are grateful to William Death for its loan. The late Victorian and Edwardian era saw a craze in picture postcards, two gramophone topics are shown. The little boys are shown with "A New Toy". This South African card was loaned by Edward Broad. "His Master's VICE" is American and was loaned by Peter Betz. It is itself a pun on an almost identical 'straight' card which was in circulation at the time correctly titled 'His Master's Voice' and which was used recently by Jim Walsh to illustrate an article in "Hobbies" magazine. The remaining views of a factory were taken in the IROLITE Company's works, where the short-lived MUSGRAM records were produced, around 1910. Mr. Cheer, the director, is seen looking at a record, while men are processing discs in the lower picture. We hope to be able to be able to include an article on the company, together with a listing of Musogram discs in our next issue. In the meantime, your Editor would be grateful to receive from Members details of any Musogram discs in their possession in the hope that it will add to the list we have.

11th. June OUR PRESIDENT'S EVENING

8th July A programme to be presented by Alf White and Geoff Townsend

## OBITUARY

We regret to announce the deaths, earlier this year, of Mr. Fuji Fujita of Tokyo and Mr. A. V. Burley of St. Leonards, Hereford. Both members had been active collectors since their youth and in their latter years had helped following generations in their collecting activities.

FOR SALE FOR SALE FOR SALE

A table model LUMIÈRE gramophone. This plays well, but there is one small tear in the diaphragm about  $\frac{1}{2}$  inch from the rim. The lid of the box is slightly scratched.

E. LUPTON, BRANGORE, CHRISTCHURCH, HAMPSHIRE, ENGLAND.

TELEPHONE (9 a.m. to 4 p.m.) (Mons. to Fri. inclusive)

# THE "CINCH"

The Most Marvellous Instrument Ever Made by  
THE BRITISH ZONOPHONE COMPANY, Ltd.

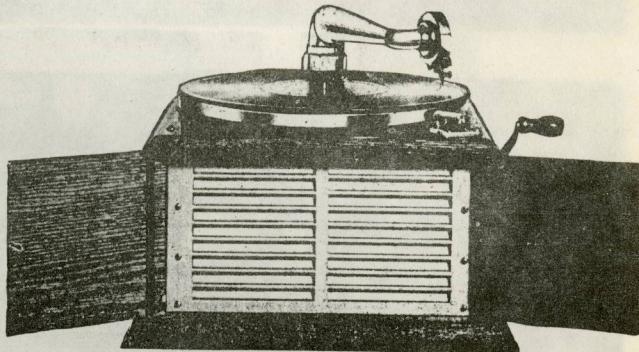


## MEASUREMENTS OVER ALL:

$14\frac{1}{2} \times 12\frac{1}{2} \times 10\frac{1}{2}$  in.

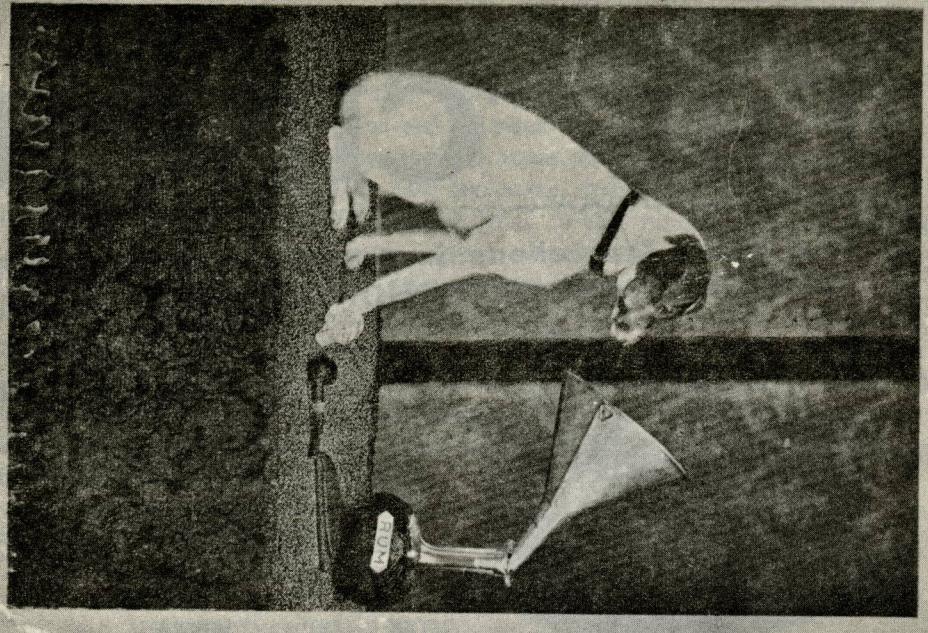
Zonophone Taper Arm.  
The famous "New Zonophone" Sound Box.  
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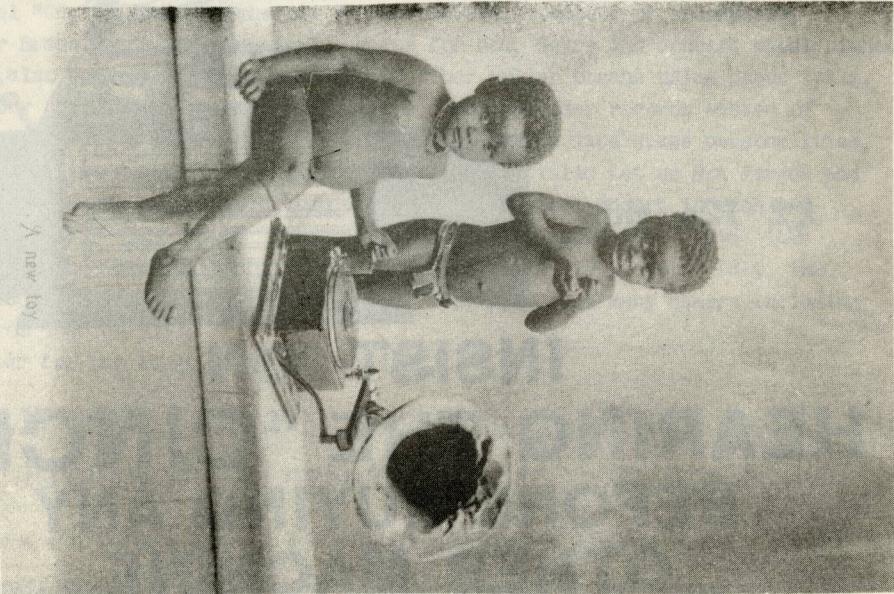
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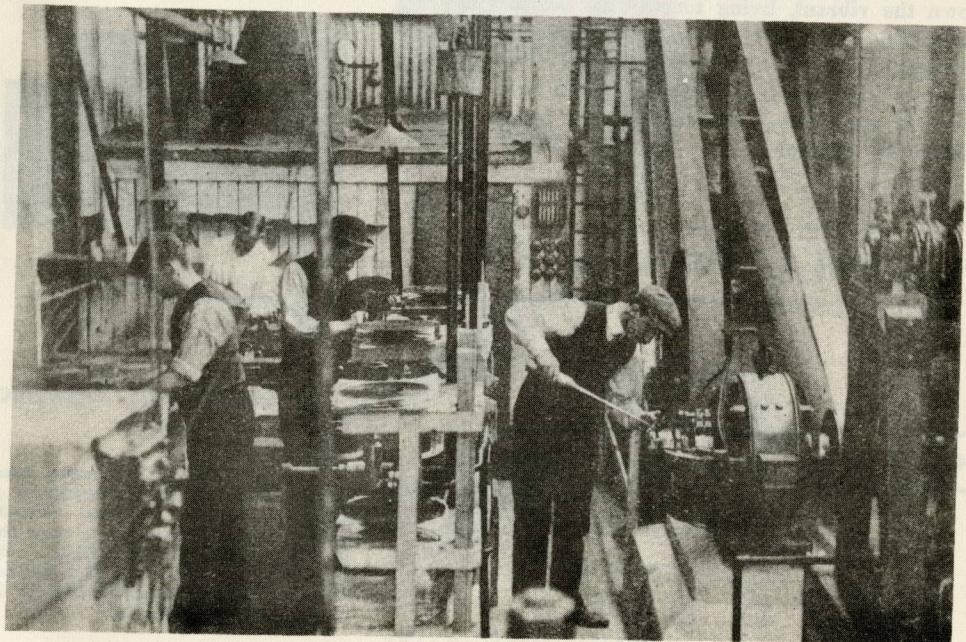
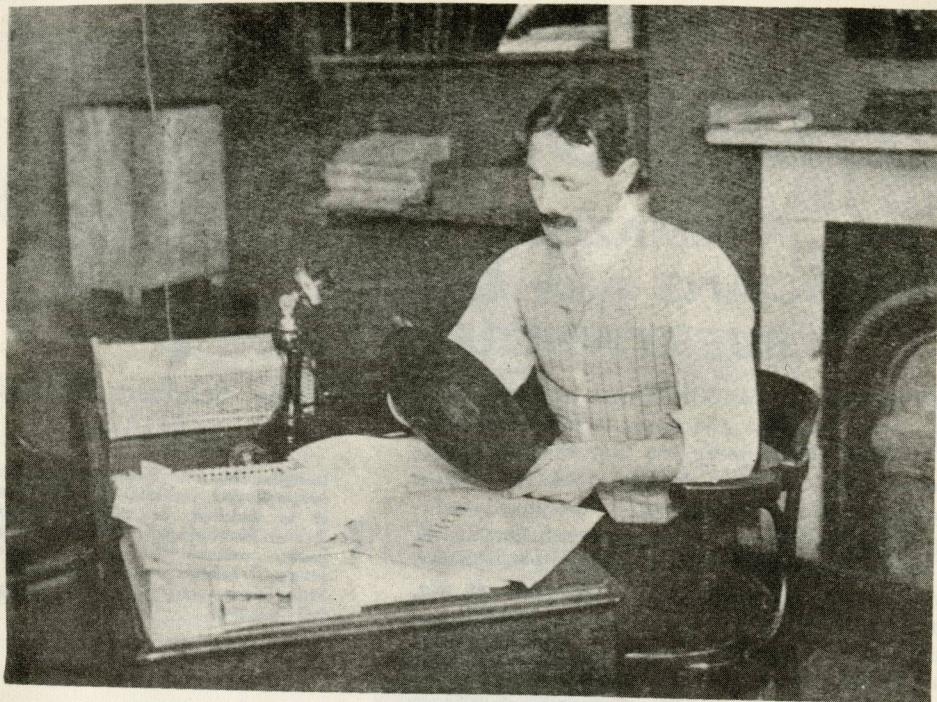
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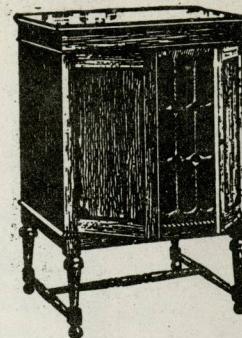
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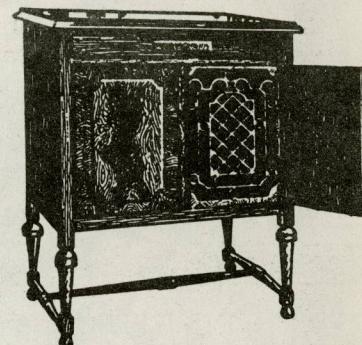
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